MCI Telecommunications
Corporation

1801 Pennsylvania Avenue, NW
Washington, DC 20006

EX PARTE

October 10, 1997

William F. Caton
Acting Secretary
Federal Communications Commission
Washington, D.C. 20554

Re: Ex Parte Submission
Federal-State Joint Board on Universal Service; CC Docket No. 96-45
Forward-Looking Mechanism for High Cost Support for Non-Rural LECs; CC Docket No. 97-160

Dear Mr. Caton:

On October 8, 1997, the Hatfield Model Sponsors (HMS) participated in a workshop session on proxy cost models hosted by the Universal Service Branch of the Common Carrier Bureau. At this meeting, the HMS were represented by Rich Clarke and Tom Madden of AT&T, Chris Frentrup of MCI, John Donovan of Telecom Visions, and Ernie Carter of BCI. Several other members of the HMS team participated by telephone.

At this meeting, the BCPM sponsors attempted to rebut the documentary evidence that the HMS submitted at the previous workshop, which demonstrated that the Hatfield Model provides a quality of service that meets fully the Joint Board and Commission's specifications for supported universal service on copper loops up to 18,000 feet in length. During the BCPM sponsors' presentation, it rapidly became clear that the statistics supplied by the BCPM sponsors provided still further confirmation that all loops engineered by the Hatfield Model are fully capable of supply supported universal service – even if they are carried up to 18,000 feet on copper cable.

In particular, it became apparent that the BCPM sponsors' allegation that 18,000 foot copper loops cannot provide the required standard of service, was based on nonforward-looking engineering assumptions that are at variance from those followed in the Hatfield Model – or because it is the BCPM sponsors' intention that the network be engineered to carry high capacity services that exceed universal service specifications. The BCPM sponsors' faulty engineering suppositions about the Hatfield Model included:

i. assuming that *all* copper cable is 26 gauge – when the vast majority of copper cable that would serve distant customers in the Hatfield Model is 24 gauge;

ii. assuming that cable runs would include bridge taps, which is not a forward-

looking engineering practice – nor engineered into the Hatfield Model;
iii. assuming that *all* plant would be aerial and thus subject to heat impairment – despite the fact that outside aerial plant never constitutes more than 25 to 30% of Hatfield plant.

While correction of these misinterpretations are themselves sufficient to conclude that 18,000 foot Hatfield loops meet universal service specifications, there were several other misconceptions expressed by the BCPM sponsors. These included the amounts of signal loss assumed in the switch and the correct specifications for the abilities of certain pieces of DLC equipment. Furthermore, it appears that the BCPM sponsors may have mischaracterized a modem "study" that they refer to in their viewgraphs. When the BCPM sponsors submit on to the public record the original source materials that they rely on for the above views, the HMS will provide a more complete refutation of the BCPM sponsors' characterizations of these issues.

Attached to this filing are several source documents describing appropriately the capabilities of DLC equipment as well as copies of several pages off of US West's own Internet site stating that normal copper loops up to 18,000 feet are quite adequate to supply advanced services such as ISDN-BRI (144 kbps). In addition, in last week's filing by the HMS of their running of the FCC's six selected wire centers, the two pages of this submission that described the operation of the HM 5.0 Distribution and Feeder modules was incomplete. Attached are the two correct pages.

Two copies of this Notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206(a)(1) of the Commission's rules. Because of the late hour of this meeting, this notice is being filed the following business day.

Respectfully submitted,

Chris Frentrup

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CC: FCC Staff - Bryan Clopton, Abdel Eqab, Wade Harriman, Chuck Keller, Stagg Newman, Jeff Prisbuy, Bill Sharkey, Natalie Wales, Brad Wimmer

State Staff - Charlie Bolle - South Dakota PUC, Ann Dean - Maryland PSC, David Dowds - Florida PSC, Anthony Myers - Maryland PSC, Barry Payne - Indiana Office of Consumer Counsel, Brian Roberts - California PUC, Kevin Schwenzfeier - New York DPS, Tiane Sommer - Georgia PSC

Kbps

Transmission speeds are most accurately measured in bits per second, or bps. Commonly used abbreviations are:

- Kbps Kilobits per second Thousand bits per second
- Mbps Megabits per second Million bits per second
- Gbps Gigabits per second Billion bits per second

The term bit is a contraction of binary digit, the smallest unit of digital information - either an on or off signal. The term byte is similar, but actually represents one full character - a letter, number or symbol - of seven or eight bits, depending on the computer code used. The term is an older analog designation, and refers to the number of times per second the sine wave of an analog voice line can be successfully modified.

Although the terms bit, byte and baud are frequently interchanged, they are not in fact the same. Speeds on these pages are consistently referenced in bits - kilobits, megabits and gigabits per second.

Last Call Return

This feature allows a customer to automatically redial the number of the last incoming call to that line, whether the call was answered or not. The customer does not have to know the number of the calling party. If the called number is busy, the feature will redial the called number for a limited period of time. A tone alerts the customer when the called line is available.

Loop Qualifications Requirements

U S WEST Single Line Service is offered where ISDN compatible facilities and equipment are available. Service is generally considered available for loops 18,000 feet or less in length. Loops greater than 18,000 feet must meet ISDN extension technology design requirements and will be considered available if ISDN compatible pair gain systems are in place or planned to serve the area based on scheduled placement of compatible pair gain systems. If no pair gain system is in place or planned, loops greater than 18,000 feet in length will also be considered available if single line loop extension equipment can be deployed and the loop is within the design limitation of this type of extension equipment. There will be cases where it will be impossible to provide Single Line ISDN Service to a location immediately due to the inherent restrictions that must be met as part of the ISDN design requirements. In other words because of the nature of the existing loop network some customers may not receive service.

One of the first steps in the ordering process is the determination of whether or not the local loop or the facility between the central office and the customer premises meets the design criteria for an ISDN loop. When special action is required the order interval may have to be lengthened in order to provide the service.

Mbps

Iowa ISDN Single Line Service

Basic Service

Iowa Basic Service Pricing

	Service Area
Measured Service	$48
CALC	$4.97
Measured Service with 200 Hour Usage Allowance*	$73
Flat Rate	$184
Installation Fee	$110
Loop Extension Charge (if needed)	$100
Usage Charges -for voice and data calls	$.03/minute
Other charges may apply.	
*B channel-outgoing - 200 hours of total B channel usage.	

Availability

- To determine if ISDN is available at your location you must first determine if your local serving central office is identified as having ISDN available. This information is located under Availability.
- If ISDN is available in your local central office, U S WEST still has to qualify your communications loop from your location to the central office.
- Service is generally considered "available" for loops 18 kilofeet or less in length. Loops greater than 18 kilofeet in length must meet ISDN extension technology design requirements.
- If the loop is greater than 18 kilofeet and if U S WEST can provide the service without signal loss, U S WEST will do so. This assumes facilities are available.
- There is a one-time Loop Extension Charge ($100) for loops

greater than 18 kilofeet in length.

Rate Stability Plan

Rate stabilization is available for Single Line ISDN.

Standard Packages

The standard package includes a total of six call appearances, per terminal. The six call appearances will include one Primary Directory Number (PDN), and five call apppearances made up of the following:

- Maximum of one Secondary Directory Number (SDN)
- Maximum of five call appearances of the PDN (same number)
- Maximum of four call appearances of the SDN (same number)
- Maximum of two shared Directory Numbers

Additional call appearances are available at rates and charges specified in Optional Features and Functions.

Standard Features and Functions

Voice Features

- Call Appearance
- Call Exclusion
- Call Forwarding Busy Line - All Calls (Pre-programmed)
- Call Forwarding - Don't answer (Pre-programmed)
- Call Forwarding Variable - All Calls
- Call Hold
- Call Transfer
- Call Identification Blocking - Per Call
- Calling Line Identification
- Conference
- Display
- Drop
- Intercom
- Message Waiting Indication
- Primary Directory Number
- Ringing Options
- Second Directory number
- Shared Call Appearance
- Speed Calling
- Standard Configuration Group

Interconnect & Resale Resource Guide

1. Business Procedures

2. Pre-Ordering Information

3. Product Information - Resale

- Business Exchange
- Residence Exchange
- Centrex Plus, Centrex, Centron Essex
- Central Office Automatic Call Distribution (CO-ACD)
- Direct Inward Dialing
- Frame Relay
- PBX Service
- Private Line Services
- Public Access LIne Service - Basic and Smart
- Single Line/Centrex 21 ISDN
- Voice Messaging Service/Business Voice Messaging
- Wire Maintenance and Prewire

4. Product Information - Interconnect

5. Manual Ordering Process/Forms

SINGLE LINE/CENTREX 21 ISDN

Product Description

Basic product features

Single Line Service is a digital service that provides an integrated voice/data capability over the 2-wire customer facility. Utilizing NI-2 technology and the public switched network, Single Line Service distributes voice and/or data, at speeds up to 64 kbps per B channel and up to 16 kbps per D channel, by a standard method of end user access called a Basic Rate Interface.

The BRS is composed of two B (Bearer) channels and one D (Delta) channel.

NI-2 conforms to Inter-nationally developed, published, and recognized standards generated by the International Telegraph and Telephone Consultative Committee (CCITT).

Single Line Service uses NI-2 technology providing for digital network architecture which provides both a voice connection and high or low speed data connection simultaneously over existing telephone lines (twisted pair). These telephone lines are called Digital Subscriber Lines (DSL).

NOTE: U S WEST supports the NI-2 standard for hardware, but the features offered are NI-1

The DSL between the customer's premises and the central office is the Basic Rate Service (BRS). The BRS may 1B+S or 2B+S, or 1B+D or 2B+D.

The DSL has a transmission rate of 144 kbps (kilobits per second) divided into three channels. There are two "B" channels capable of 64 kbps each and one "D" channel capable of 16 kbps. The "D" channels throughput speed will vary significantly, dependent upon the Customer Provided Equipment. The "D" channel packet data is bursty (store and forward) in nature, so the availability of the network at a given time will also affect the throughput speed. Packet transmission is explained later in this section.

Each B channel is capable of:

Circuit switched voice

Circuit switched data

The D channel is capable of:

Signaling (Q.931 protocol)

Packet Data (X.25 protocol)

Single line Service offers two types of applications.

They are:

voice only (2B+S) (no data allowed)
Note: Available in CO & SD Only

voice /data (2B+D) (includes circuit switched voice, data and packet switched data)

BRS CONFIGURATION

NI-2 supports Standard Network Interfaces. NI-2 does not refer to the Point-to-Point or Multipoint Interface.

All Standard Interfaces support from one up to eight terminals per BRS. A single device may be capable of both circuit switched data and voice, as well as D Channel packet switched data.

Only one terminal may use a B channel at a time. The D channel may be used by eight packet switched data terminals simultaneously.

Basic product capabilities and restrictions

Although it is technically feasible to provide interstate and intrastate 800/WATS traffic over Single Line Service, there are major regulatory and legal hurdles that need resolution. At this time we are not able to provide interstate or intrastate 800/WATS access over Single Line Service.

2B1Q (two binary one quaternary) signaling operates to a loss capability of 40 dB at 40 kilohertz, as measured by a nominal 130 ohm termination at the customer network interface. Using 26 gauge wire, for example, BRS will work to about 18,000 feet (about 3.4 miles) using normal cable and pair. Loops more than 18,000 feet in length will be considered "available", but not loop qualified, a non-loop qualified charge will be applied.

NOTE: Each customer location must be checked. For example, bridge taps on the facility may shorten the distance. Also, in order for the pair to be qualified, the dB loss must qualify, and the cable must be non-loaded.

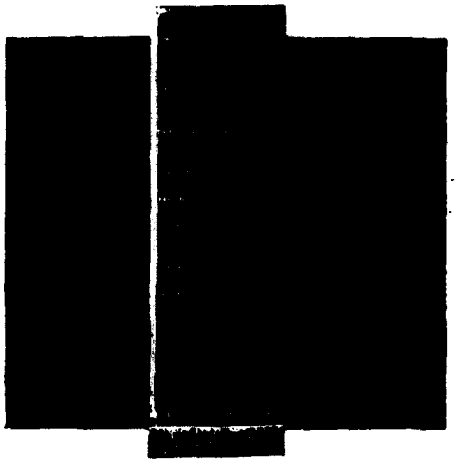
The customer or the customer's authorized agent will be responsible for the procurement of associated Customer Premises Equipment (CPE) and will ensure compatibility with the Single Line NI-2 Services.

- Packet Switched Data is not available with Centrex 21 ISDN.
- A minimum of 3 lines is required and a maximum of 50 lines per location is required for Centrex 21 service. This could include Centrex 21 Analog as well as Centrex 21 ISDN lines on the same account.

The customer is responsible for placement, installation, operation, maintenance, repair and replacement of all inside wire (including riser cable) not owned by the Company, and CPE that the customer uses in connection with this service. Premises wiring and CPE must be compatible with the Company's provisioning of service.

Should any change in inside wiring (including riser cable) not owned by the

Litespan®-2000
Optical Loop Carrier System



MAJOR FEATURES OF THE LITESPAN-2000

- TR-008 And TR-303 Integrated Digital Loop Carrier (IDLC)
- SONET OC-3 Optical Digital Loop Carrier (ODLC)
- Starspan Fiber-In-The-Loop (FITL)
- Bandwidth-On-Demand
- Reduces Maintenance Costs
- SONET Add/Drop for Distributed Bandwidth
- Remote Operation System Interface Capabilities
- Enhanced DLC Service Offerings
- Supports Multiple Switch Interfaces
- Bellcore Compliant
- RIDES® Compatible

GENERAL DESCRIPTION

The Litespan-2000 Optical Loop Carrier is an advanced SONET-based TR-303 Digital Loop Carrier designed for superior performance in the harsh environment of the subscriber loop. A point-to-point Litespan system can serve up to 2,016 lines, provide extremely low cost residential telephone lines (POTS) and offer the flexibility of provisioning wide bandwidth services in the same plug-in channel unit slots. Once common control and optical interface plug-ins are installed, the system can be modularly increased in increments of 4 POTS lines up to a total of 2,016 lines for point-to-point applications or up to 6,048 lines using the dual-feeder feature.

EFFICIENT DIGITAL SWITCH INTERFACES

Litespan supports the Bellcore TR-057, Bellcore TR-008, TR-909 with Starspan® and TR-303 Integrated Digital Loop Carrier (IDLC) requirements and offers the choice of an electrical interface at the DS1 rate or a direct optical interface at the SONET OC-3 rate. The Litespan can simultaneously support the different switch interfaces from the same common control making the system ideal for the transition to future network service and service to multi-entity offices.

DESIGNED IN ACCORDANCE WITH BELLCORE TR-057 REQUIREMENTS

Coupled to a single-mode optical fiber, Litespan-2000 is an extremely reliable Digital Loop Carrier. The remote terminal and central office terminal equipment is designed for the full outside plant temperature and humidity range in accordance with Bellcore TR-057 requirements. Both the common electronics and optics can be independently protected, providing complete 1:1 protection of all common equipment.

WIDEBAND CHANNEL SLOT

Each channel unit slot has access to 16.384 Mbps. Today this means that wideband (T1, etc.), as well as narrowband (POTS, ISDN, etc.) services can be provided from the same channel unit slots. The bandwidth to each line unit slot is allocated via the Litespan's Integral Time Slot Interchanger (TSI) providing access to the integral SONET OC-3, VT1.5 Add/Drop multiplexer. This allows the user to drop only the bandwidth needed at each site. This capability is also used to integrate Fiber-In-The-Loop (FITL) distribution systems into a Litespan fiber channel bank utilizing the Starspan feature.

REMOTE SOFTWARE-BASED OPERATIONS

With Litespan-2000, all alarms, facility performance, hardware and software-programmable channel unit settings and features can be remotely accessed, interrogated and provisioned, saving time in all phases of telephone operations. The Litespan is a TL1-based machine that is in-service upgradeable to CMISE/ASN.1. The OS interface may be accessed locally or remotely via an RS-232 asynchronous link or through an X.25 packet network. This allows for "flow-through" service order provisioning.

FLEXIBLE SONET NETWORKING

Litespan's SONET Add/Drop transport capability allows more flexible networks to be established in a Carrier Serving Area environment. Up to five remote terminal sites are supported by Litespan, allowing bandwidth to be distributed to the remote sites under software control. Utilizing the dual-feeder capability at the Central Office Terminal (COT) increases the line capacity to 6,048 lines. The SONET-based architecture of Litespan also allows connections to be established from one remote site to another without having to involve the Litespan Central Office Terminal.

STARSPAN

The Starspan system is a Fiber-In-The-Loop (FITL) distribution system integrated into the Litespan-2000 SONET Access System. Starspan offers a variety of ONU sizes from 12 to 96 lines. The integrated Starspan architecture of the Litespan-2000 common control can simultaneously support both copper- and fiber-fed services at each terminal.

DSC
COMMUNICATIONS

Litespan®-2000 Specifications

TYPES OF SERVICES

4-Wire
800 Service Line
800 Service Trunk
AIOD
Centrex Lines
Consolidation of SLC-96 Mode 1
Consolidation of SLC-96 Mode 3
Consolidation of SLC Series
5-Feature Package B
Dial Tone First Coin
DID
Digital Data Services (DDS)
DLC Transport
Fractional T1
FX Lines and Trunks
Hi-Cap T-1 Transport
Inter-office T-1
Intra office T-1
ISDN
Off-Premises Extension
Off-Premises Station
P-Phone (Meridian Business Set)
PBX Tie Line
PBX Trunking
POTS
Private Network T1 Transport
Secretarial Line
Voice Data Type 1
Voice Data Type 2
Voice Data Type 3
WATS Line 2-Way
WATS Line Out
WATS Trunk 2-Way
WATS Trunk Out
Private Line Automatic Ring Down (PLAR)
DC Alarms

ENVIRONMENTAL CONDITIONS (PER TR-057)

Temperature	
CO & RT	-40° to +65°C (-40° to +150°F)

PHYSICAL MEASUREMENTS

Rack Assembly		
	Height	213 cm. (7 ft.)
	Width	66.7 cm. (26 in.)
	Depth	30.8 cm. (12 in.)
Outdoor Cabinet		
	Height	152.4 cm. (60 in.)
	Width	203.2 cm. (26 in.)
	Depth	104.2 cm. (41 in.)

BELLCORE COMPLIANT

The Litespan-2000 and Starspan systems are designed in compliance with the following major Bellcore Standards:

Operations Technology Generic Requirements (OTGR)
TR-TSY-000008
TR-TSY-000057
TR-TSY-000253
TR-TSY-000303
TR-TSY-000496
TR-TSY-000909

OPTICAL INTERFACE

Fiber	Single-Mode
Connectors	FC/PC, or Customer-Specified
Wavelength	1310 ± 30nm
Format	SONET

DS1 INTERFACE

DSX-1	Up to 56 DS1 positions available per channel bank
Line Code	B8ZS, ZCS
Framing Formats	SF (D4, SLC-96), ESF
Alarm Monitoring	RCV frame slips, AIS, ESF, CRC, Yellow, BPVs

T1 INTERFACE

T1 SPAN	Up to 56 T1 positions available per channel bank
Line Code	B8ZS, ZCS
Framing Formats	SF (D4, SLC-96), ESF
Alarm Monitoring	RCV frame slips, AIS, ESF, CRC, Yellow, BOVs
Line Powering of	
Span Voltage	-130 Vdc
Current	60 mA
Line Build Out (XMT)	7.5, 15, 22.5 dB @ 772 kHz
Line Build Out (RCV)	ALBO

POTS

Capacity	Up to 224 lines per channel bank 4 lines per POTS Card
Loop Resistance	1930 ohms (including set)

COIN

Capacity	Up to 224 lines per channel bank 4 lines per Coin Card
Loop Resistance	1730 ohms (including telephone set) Dial Tone First/Coin First

UVG (UNIVERSAL 2-WIRE)

Capacity	Up to 224 lines per channel bank 4 lines per UVG Card
Loop Design	Carrier Serving Area Rules Loop Start/Ground Start Loop Reverse Battery

EQUALIZED UNIVERSAL VOICE GRADE (EUVG)

Characteristic	Impedance	Min. (dB)	Max. (dB)
XMIT TLP	600Ω	-9.0	+1.0
	900Ω	-9.0	+1.0
RCV TLP	600Ω	-6.0	+6.0
	900Ω	-6.0	+6.0

UNIVERSAL 4-WIRE (U4W)

4-Wire Impedance	Provisionable for 150, 600 or 1200 ohms
Programmable Gain	0.1 dB steps over a 24.5 dB range
Signaling Mode	FXS, FXO, DX

4-Wire E & M (E&M)

Signaling Modes	E&M modes I to V Tandem modes I and II PLR (Pulse Link Repeater) Modes I and II
4-Wire Impedance	600 ohms
Provisionable Gain	0 dB steps over a 24.5 dB range
Signaling Leads	E, M, SG, SB

OFFICE CHANNEL UNIT DATA PORT (OCUDP)

Data Rates	2.4, 4.8, 9.6, 19.2, 56 or 64 kbps
Loopback Types	OCU, CSU, DSU, and customer-controlled far-end loopback
Provisioning Options	Secondary channel, customer data error correction

DSO DATA PORT (DSODP)

Primary Channel Rates	Secondary Channel Rates
2400	133.3
4800	266.6
9600	533.3
19200	1066.6
56000	2666.6
64000	Sec. Chan. Not Available

BASIC RATE INTERFACE UNIT (BRIU)

Data Formats	2B+D, B1+D, B2+D, or D only
DSL Data formats	2B1Q
Bit Error Rate	<10⁻⁷ for loops 0 and 2-15 with all impairments

ASYNCHRONOUS DS1U (ADS1U)

Framing Formats	N/A (transparent)
Line Coding	AMI
Zero Suppression	B8ZS
Equalization	1 to 655 feet (distance from cross-connect) 5 steps

ASYNCHRONOUS T1U (AT1U)

Framing Formats	N/A (transparent)
Line Coding	AMI
Zero Suppression	B8ZS
Equalization	
Receive	Automatic Line Build-Out (ALBO)
Transmit	0 dB, 7.5 dB, 15 dB, 22.5 dB

ELECTRONIC BUSINESS SET (EBS) (P-PHONE)Ω

Maximum Loop Length For Powered Phones (38 mA max.)	500 Ω DC loop resistance or < 20 dB @ 8 kHz at the network interface
Maximum Loop Length For Locally Powered Phones (20 mA max.)	500 Ω DC loop resistance or < 20 dB @ 8 kHz at the network interface
Battery:	
Loop Powered - Display	38 mA max. per line
Loop Powered - No Display	20 mA max. per line
Locally Powered	20 mA max. per line
Loop Current Detection Threshold	Must detect > 4.5 mA Must not detect < 1.7 mA
Loop Current: 52.0 Ω Volt Battery:	38 mA max. into Telset

DSC COMMUNICATIONS

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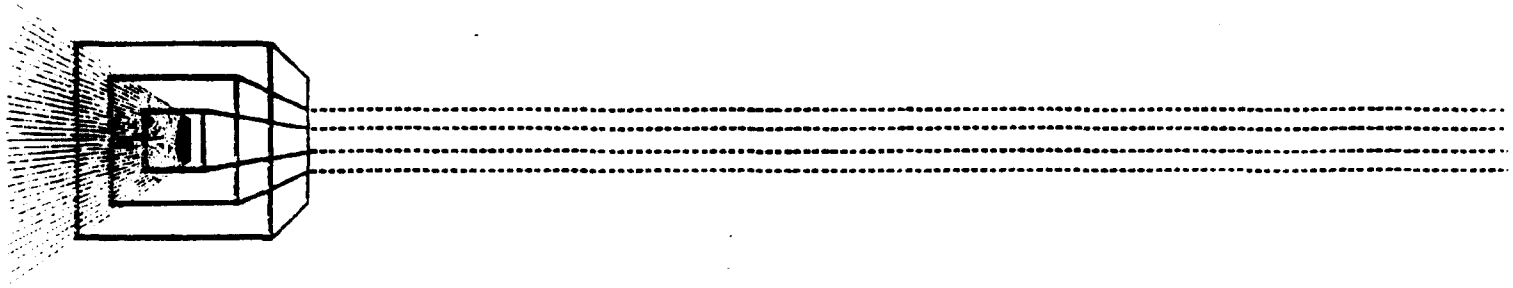
1420 McDowell Blvd. North • Petaluma, CA 94954 • (707) 792-7000

POTS

Capacity — Up to 224 lines per channel bank
4 lines per POTS Card

Loop Resistance — 1930 ohms (including set)

SLC Series 5 Carrier System

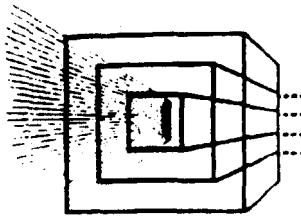


For additional information about the SLC® Series 5 Carrier System, please contact your AT&T Sales Representative.

AT&T Network Systems
Marketing Communications
20738 RL-A86

AT&T
The right choice.

Terminal-To-Terminal Voice Frequency Transmission Characteristics



Parameter	Value (Measured at 25° C)	
	POTS	SPOTS® CU
Loop Resistance (Beyond the RT excluding the Set)	0-1500 Ohms	CSA Loops
1000-Hz Loss (±0.5 dB Typical ± 1.0 dB max)	1 dB ($R_{EXT} \leq$ 1000 Ohms)[1] 0 dB ($R_{EXT} >$ 1200 Ohms)[1]	0 db[2]
Bandwicth (Relative to the 1000-Hz loss)	0 to −3.0 dB at 300 Hz and 3000 Hz 0 to −1.5 dB at 400 Hz and 2800 Hz	
Return Loss at the COT[3]	ERL ≥ 18 dB SRL ≥ 12 dB	
Return Loss at the RT[4]	ERL ≥ 18 dB SRL ≥ 15 dB	
Idle Channel Noise (at the RT)	20 dBmC Maximum	
Signal-to-Distortion Ratio (at−10 dBm)	> 33 dB	
Data Pulse Distortion (PAR)	> 90	
Gain Tracking (1004 Hz) −37 dBm0 to + 3dBm0 −50 dBm0 to −37 dBm0	 ±0.5 dB Maximum (±0.25 cB Average) ±1.0 cB Maximum (±0.5 cB Average)	
Intermodulation Distortion (−13 dBm0 Input)	A-B (R2) Product: >43 dB 2A-B (R3) Product: >44 dB	
Single Frequency Distortion (0-12 kHz 0 dBm0)	<−28 dBm0	
Impulse Noise[5]	≤15 Counts in 15 Minutes	
Overload at COT and RT	≥ +3 dBm0	
Longitudinal Balance at the RT[3] (minimum)	200, 500, 1000 Hz: 58 dB 3000 Hz: 53 dB	
Loop Current	>20 mA	>23mA

Note:

1. Measured as insertion loss between 900-ohm terminations. R_{EXT} includes both the loop resistance and the station set resistance. Actual threshold value for R_{EXT} is 1100 ohms ±100 ohms.
2. Measured as the ICL with the RT terminated in 600 ohms and with the COT terminated in 900 ohms.
3. Measured with respect to 900 ohms and 2.16 μF with the 4-wire path broken or with the other end terminated in 1100 ohms in parallel with 0.03 μF.
4. Measured with respect to 600 ohms and 2.16 μF with the 4-wire path broken or with the other end terminated in 900 ohms and 2.16 μF.
5. Measured with a holding tone of −13 dBm0 and a threshold of 59 dBrnC0.
6. Measured by IEEE method 455-1976.

UMC1000

Data Sheet

System Overview
UMC 1000A

The Universal Modular Carrier (UMC) System 1000A is a modular digital loop carrier system capable of economically serving from six to 600 subscribers in any network configuration, over any transport media, and offering any service from POTS to ISDN.

The flexibility of the UMC makes it ideal for both new growth deployments and for upgrades to existing networks. Its high density design allows the UMC to offer a host of services from a single assembly. Integrated common control allows each UMC terminal to serve as a 120 line intelligent network node that can process calls and monitor the system database.

A UMC system is comprised of two basic network elements: The Local Exchange Terminal (LET), located in the central office; and the Remote Subscriber Terminal (RST), located at the end of various transport media. Any UMC assembly can serve as LET or RST. These basic elements provide POTS and enhanced telephone services such as ISDN over fiber optic, T1 and analog (radio or copper) transport media. Any UMC terminal can be deployed in Point-To-Point, Star, Drop & Insert, and Tree configurations. The UMC also supports Universal and integrated (TR-8 & TR-303) configurations.

An RST may be rack mounted inside a remote switch building, built into an indoor cabinet or deployed with outside plant facilities in a range of secure, sealed outdoor cabinets. UMC cabinets range in size from 30 to 672 lines.

Subscriber services include POTS, payphone, EBS (P-phone), ISDN, ground start, E&M, T1, fractional T1, and data (analog or digital) lines in any combination.

The LET and RST are composed of identical, 26 slot Channel Bank Assemblies (CBA's). Each CBA features two Central Processing Unit slots, two Power Supply Unit slots, and 22 general purpose slots on a 98 Mbps backplane.

The UMC's advanced time slot interchanger allows it to function as a true 1/0 cross connect with highly flexible protection and concentration capabilities.

Several design features make the UMC CBA especially versatile. A single shelf provides all common control and distribution of services. There is no need for a separate common control shelf, reducing the start-up costs for any terminal. Any service card may be plugged into any general purpose card slot. All UMC cards are the same physical size, from the six DS0 (64 Kbps) POTS card to the 50 Mbps Fiber Optic Transceiver.

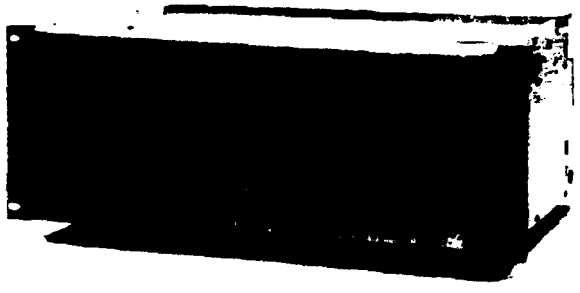
The UMC can be expanded quickly and easily by adding one or more CBA's linked to the primary shelf by fiber optic cable. Each UMC system may be configured for up to 672 channels (64 Kbps) or a maximum of eight CBA's.

UMC transport and services are equipped using simple, low maintenance plug-in modules. All plug-ins are environmentally hardened to withstand harsh conditions. Transceivers and circuit packs require no hardware strapping, because most options are configured from the Craft Interface software.

The UMC Craft Interface is a simple, menu driven software provisioning system accessed from any LET or RST with a dumb terminal, a PC terminal emulation program, or a modem. The Craft Interface provides provisioning, maintenance, traffic monitoring, testing and system administration support.

The design of the UMC is based on the fundamental principle that a Next Generation Digital Loop Carrier (NGDLC) system should adapt to the customer's network requirements. Network requirements should not be dictated by limitations of the NGDLC. Holding to this principle, Advanced Fibre Communications has created an NGDLC that fits into diverse networks and supports various transport media in a limitless number of configurations. The UMC is compact, versatile, easy to install, and easy to maintain.

UMC 1000A CBA



UMC1000™

UMC 1000A Specifications

Transmission

U (ISDN)	160 Kbps ± 50 ppm
T1	1.544 Mbps ± 32 ppm
Fiber	49.152 Mbps ± 50 ppm
Analog	2400 Baud ± 100 ppm

Companding

μ-Law 8 bits/timeslot

DC Supervisory

Exchange	Off hook 900 Ω
	On hook 25 KΩ
Remote	DC supervisory range 1800 Ω @25mA (w/phone) 1930 Ω @ 23 mA
	Idle circuit voltage ≤ 55 volts (battery feed) ≥ 44 volts

Impedance

900 Ω +2.16 μF; 600 Ω +2.16 μF

Frequency Response

300 Hz - 3.4 KHz (+0.5, -1.0 dB)

Ringing

Generation	Software programmable (20 Hz or 30 Hz)
Voltage	93 Vrms (Sine)
Cadence	Ring following

On Hook Transmission

Between ring bursts, 5 seconds after call completion

System Synchronization

1.544 Mbps external ±32 ppm (DSX-1)
64.0 Kbps external ±50 ppm composite clock

Powering

LET	-42 to -63 VDC @ 4 Amps maximum
RST local AC	220V - 110 V charger 50 - 60 Hz 1 Amp
RST exchange DC	T1 ±130 Volt

Temperature Range

Inside (rack mounted) controlled environment	0°C (32°F) to 50°C (122°F)
Inside ambient temperature	10% to 80% relative humidity
Outside (remote subscriber cabinet) environment	-40°C (-40°F) to 50°C (122°F)
Outside ambient temperature with full sunlight	5% to 95% relative humidity
Plug-in units (LET and RST)	-40°C (-40°F) to 65°C (149°F)

CBA Dimensions

Height	7 in (17.8 cm)
Width	19 in (48.2 cm)
Depth	12 in (30.5 cm)

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Data Sheet 1-001, November 1996

A Summary of the Preliminary Hatfield Model 5.0 Distribution and Feeder Modules (Demonstration Versions)

Introduction

The following discussion summarizes the overall operation of the demonstration versions of the Distribution and Feeder Modules used to illustrate the application of the Hatfield customer location and population clustering process.

Distribution module

Distribution Module input data include invidividual records for clusters and "outliers." Among other data, cluster records contain information about the number of lines in the cluster, the area of the cluster, and the location of its centroid. Outlier record data are similar, but because outliers "home" on the nearest cluster, each outlier record must indicate the identity of the outlier's "home" cluster. Outlier records may represent several subscriber locations, and several outliers may home on a given cluster. Outliers are assumed by the model to be arrayed in a linear fashion along roads, with only one side of the road being populated.[1]

The Distribution Module operates on input records as follows:

clusters: The module constructs backbone and branch cable within the total area of the cluster; the SAI(s) (and remote terminal(s), if applicable) are located in center of cluster; the subfeeder cable extends to this point.

outliers: The model constructs copper cable from the SAI or RT in the center of the cluster to the end of the outlier distribution; the outlier distribution is a linear array of subscriber locations presumed to be along one side of a road; the outlier area is uniformly divided among all customer locations, which are assumed square; the outlier "centroid" is assumed to lie in the center of the linear array, so that the array extends both toward and away from the cluster center from the nominal outlier location.

use of fiber: The model constructs fiber feeder in several cases: 1) when the total feeder distance exceeds the user-adjustable fiber threshold (default = 9,000 ft); 2) when the total distance, including feeder, backbone, and branch, exceeds 18,000 ft; or 3) when the total distance, including feeder and road cable, exceeds 18,000 ft.

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[1] The assumption that only one side of the road is populated is conservative, and will be relaxed to permit customer locations on both sides of the road in the model's final version.

To aid in comparisons with results from HM4.0, the HM5.0 (preliminary) demonstration distribution module does not yet contain the dynamic algorithms for selecting structure type (buried and aerial) according to surface and rock conditions and lifecycle costs, nor does it include the calculations for selecting copper or fiber feeder according to lifecycle costs. These calculations will be included in the final version of the model. In a very few clusters, the sum of the branch and backbone cable distances may exceed 18,000 ft. The final version of the Distribution Module will subdivide such clusters to insure copper distances never exceed 18,000 ft.

Feeder module

The HM5.0 demonstration feeder module is essentially the same as that used in HM4.0. The demonstration version differs from the HM4.0 feeder module only in that the connecting cable calculations have been removed. The final version will contain the dynamic structure choice calculations discussed above.